

FERTILIZER N INDEPENDENT AND DEPENDENT
SWEET POTATO CULTIVARS

(Variétés de Patate N dépendantes et indépendantes)

Walter A. HILL, Desmond G. MORTLEY and Stafford M. CROSSMAN
Department of Agricultural Sciences
Tuskegee Institute
Alabama 36088, USA

SUMMARY

In 1983, 197 seeds from high yielding sweet potato cultivars developed at the International Institute of Tropical Agriculture (IITA) were propagated and evaluated for growth and yield. Vine cuttings of the 25 most adapted cultivars were transplanted into an unfertilized field in 1984. Total root weight ranged from 10 to 41 mt/ha, marketable root weight ranged from 1.2. to 24.7 mt/ha and foliage weight ranged from 3.1 to 30.8 mt/ha. Three cultivars from IITA (fertilizer N independent types (FNI)) - T2024, T2037 and T2041, and three USA grown cultivars - "Centennial", "Jewel" and "Rojo Blanco" (fertilizer N dependent types (FND)) were grown at 0,60 and 120 kg N/ha. The T2024, T2041 and "Centennial" cultivars produced 22, 23 and 20 mt/ha at 0 kg N/ha. Yields of 15 to 16 mt/ha were obtained from T2037, "Jewel", and "Rojo Blanco" at 0 kg N/ha. At 60 kg N/ha "Centennial", "Jewel", T2024 and T2041 produced 28, 22, 23 and 20 mt/ha, respectively ; yields of 14 mt/ha were obtained for both T2037 and "Rojo Blanco". Lower yields were produced for all cultivars except "Jewel" at 120 kg N/ha. In 1984 "Centennial" was inoculated with the N₂-fixing bacteria *Azospirillum* at 2, 4 and 6 weeks after transplanting. Inoculation increased total and marketable root yields by 12 and 17 per cent respectively.

RESUME

En 1983 des plantules issues de 197 variétés à haut rendement produites à l'IITA (Nigéria) ont été testées pour leur rendement et leur croissance. Les boutures des 25 variétés les plus adaptées furent transplantées dans un terrain non fertilisé en 1984. Le poids total de racine varie de 10 à 41 t/ha, celui des racines commercialisables de 1,2 à 24,7 et celui des feuillages de 6,8 à 66,1 t/ha. Trois cultivars de l'IITA (N indépendants), T2020, T2037 et, T2041, et trois des USA,

"Centennial", "Jewel", et "Rojo blanco" (N dépendants) furent cultivés avec 0,60 et 120 kg N/ha. Les cultivars T2024, T2021 et "Centennial" produisirent 22, 23 et 20 t/ha à 0 kg N/ha. Des rendements de 14 t/ha furent obtenus de T2037 et "Rojo Blanco". Des rendements inférieurs furent réalisés par tous les cultivars sauf "Jewel" à 120 kg N/ha. En 1983 et 1984 "Centennial" fut inoculé avec des bactéries N₂ - fixatrices, *Azospirillum*, à 2, 4 et 6 semaines après transplantation. L'inoculation accrut les rendements en racines et en feuilles.

INTRODUCTION

Though numerous studies have indicated that N and K fertilizers significantly influence yield and quality of sweet potato (sweet potato is highly tolerant of low P levels), in most parts of the tropics sweet potatoes are seldom fertilized (HILL, 1985). For this reason, the sweet potato program at the International Institute of Tropical Agriculture (IITA) does not apply fertilizers in breeding line and cultivar field evaluations. On unfertilized experiment station fields at IITA in Nigeria, up to 50 t/ha in unfertilized fields have been reported (HAHN, et al, 1984). This yield is lower than the 85 t/ha reported on fertilized experiment station fields in the USA (COLLINS and WALTER, 1981) but is substantially greater than the 3.8 to 21.5 t/ha obtained on farmers fields throughout the world (FAO, 1980). The fact that high yielding varieties of sweet potato have been developed that grow on low organic matter soils and do not require application of N fertilizer, suggest the following :

- 1) existence of sweet potato genotypes efficient in foraging for soil N reserves (TSUNO, 1970), and/or
- 2) existence of mutually beneficial plant - N² - fixing microbial associations that provide N to the plant and/or enhance root growth (HILL and CROSSMAN, 1984 ; HILL et al., 1983 ; VAN BERKUM and BOOLHOOL, 1980 ; VOSE, 1983).

Associative N₂ -fixation can be defined as N₂ - fixation by free-living bacteria under the direct influence of plants. Among the many N₂ -fixing bacterial - plant associations that have been described are the associations of *Azospirillum* spp. with grasses, cereal, crops, orchard crops and sweet potatoes (HILL, et al., 1983 ; HILL and BOHLOOL, 1980, VOSE, 1983). Though inoculation studies with *Azospirillum* have not given consistent results, a number of studies have reported increased crop yields and/or N uptake in response to inoculation (CROSSMAN and HILL, 1984 ; KAPULNIK et al., 1983 ; VOSE, 1983).

The objectives of this study were to compare soil and fertilizer N use efficiency of sweet potato genotypes that were developed under N fertilizer independent (FNI) and N fertilizer dependent (FND) conditions, and to evaluate the response of sweet potato growth to inoculation with *Azospirillum*.